

Prevalence of Nosocomial Infection in Thailand 2006

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Objective: To study the prevalence of nosocomial infection (NI).

Material and Method: A point prevalence study was done in 20 hospitals across the country in August 2006.

Results: The present study was done in 20 hospitals: three university, five regional, five provincial, and seven other hospitals. 9,865 patients were included. Male and female patients were almost equal in number with an average age of 42.7 years. The NI proportion was 6.5%, 7.0% in male and 5.9% in female patients. The prevalence rate of NI was highest in university and other hospitals (7.6%), followed by provincial (6.0%), and regional hospital (4.9%). There were two hospitals, one regional and one other hospital with NI prevalence rates over 10%. All three university hospitals had NI exceeding 7%. The infection rate was highest in ICU (22.6%), followed by surgical (6.8%), medical and orthopedic (6.7% each) departments. The commonest site of NI was lower respiratory tract (36.1%) followed by urinary tract (25.5%). Causative organisms were identified in 70.8% of all sites of infection and over 63% were by bacteria. Gram-negative bacteria were responsible for 70.2% and gram-positive bacteria for 19.9% of all pathogens. *Pseudomonas aeruginosa*, *Klebsiella* spp., *Acinetobacter baumannii*, MRSA, and enterococci were the leading bacterial isolates. At the time of the present study, 47.0% of patients were receiving antimicrobials. Cephalosporins, penicillins, and aminoglycosides were most commonly used.

Conclusion: The prevalence rate of NI in Thailand in 2006 was 6.5%, similar to previous studies. Changes in NI rates in certain hospitals, even though subtle, need additional studies to improve the efficacy of NI control.

Keywords: Nosocomial infection, Prevalence, Thailand

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Prevalence rate of NI in Thailand was as high as 11.7% in 1988⁽¹⁾. Efforts of subsequent control of the infection have been well rewarded; the infection was reduced to 7.4% in 1992⁽²⁾ and 6.4% in 2001⁽³⁾. Measures that are more effective might be able to further decrease NI rates as experienced elsewhere⁽⁴⁾. Impacts of NI on morbidity, mortality, and economy are enormous^(3,5,6). The recent changes in health-care reimbursement system have burdened small and less prepared hospitals in the care for severely ill patients.

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The increasing trend in shifting of medical personnel from governmental to private sectors further aggravates the deficit of competent personnel in governmental hospitals. These factors could increase the risk of NI and decrease the efficacy of infection control. The purpose of the present study was to follow the trend of NI prevalence rate, which could be affected by the change of health-care system.

Material and Method

A point prevalence survey on NI was done in August 2006 as previously done⁽¹⁻³⁾. Twenty hospitals across the country were enrolled by stratified random sampling. There were three university, five regional,

five provincial and seven other hospitals. A standardized protocol was used; all data were sent to Siriraj Hospital for analysis by Statistical Package for Social Sciences (SPSS). Software categorical variables were expressed as number and average respectively.

Results

The present study involved 20 hospitals and 9,865 patients. Male and female patients were almost equal in number. Their mean age was 42.7 years. The prevalence rate of NI was 6.5%, 7.0% in male and 5.9% in female patients (Table 1). The infection rate was highest in university and other hospitals (7.6%) followed by provincial and regional hospitals (6.0% and 4.9% respectively).

About one-half of the total number of cases studied was medical and surgical patients (Table 2).

The prevalence of NI was highest in ICU (22.6%) followed by surgical, medical, orthopedic and pediatric departments (6.8%, 6.7%, 6.7% and 5.5% respectively) (Table 3). About one-sixth of the total patients were in obstetric, gynecology and EENT departments. The prevalence of NI in these departments is relatively low in acute care hospitals compared with patients in others.

Lower respiratory tract was the commonest site of NI in Thailand since 1992^(2,3). In the present study, lower respiratory tract infection accounted for 36.1% of all sites of infection (Table 4). Infection of urinary tract, surgical site, and blood stream was found in 25.5%, 11.0% and 9.0% respectively.

Laboratory identification of etiologic microorganisms was not done in 16.7% and results were not available at the time of data collection in 4.6%.

Table 1. Demographic data and the prevalence of NI

Data	Categories of hospitals				Total average
	U	R	P	O	
Number patients	2,728	2,911	2,030	2,196	9,865
Male (%)	48.1	51.0	52.4	49.0	50.1
Female (%)	51.8	49.0	47.6	51.0	49.9
Age (mean-yr)	42.3	40.3	40.7	48.3	42.7
Prevalence Rate (%)					
Male	8.6	5.4	5.7	8.5	7.0
Female	6.7	4.3	6.2	6.9	5.9
Average	7.6	4.9	6.0	7.6	6.5

U = University, R = Regional, P = Provincial, O = Other

Table 2. Number of patients by departments

Departments	Categories of hospitals, %				Total patients
	U	R	P	O	
Medicine	24.5	25.6	31.0	33.2	2,773
Surgery	22.1	24.1	22.3	19.7	2,190
Pediatrics	11.2	13.5	15.6	11.6	1,269
Orthopedics	8.9	11.5	10.0	11.2	1,033
Obstetrics	10.0	8.1	9.7	5.6	829
ICU*	7.0	4.6	3.2	7.8	562
EENT**	6.2	5.2	4.4	2.8	471
Gynecology	5.2	3.9	2.3	3.2	372
Other	4.8	3.5	1.5	4.8	369

* ICU = intensive care unit

** EENT = eye, ear, nose, throat

Table 3. Prevalence rates of NI by departments and categories of hospital (%)

Departments	Categories of hospitals				Total average %
	U	R	P	O	
ICU	20.8	21.8	30.7	22.1	22.6
Surgery	7.5	4.3	7.3	9.5	6.8
Medicine	11.2	4.3	4.8	6.8	6.7
Orthopedics	5.3	7.2	6.7	5.3	6.7
Pediatrics	18.5	4.3	5.0	4.3	5.5
Obstetrics	6.7	0.4	2.2	7.1	1.1
Gynecology	0	0.9	2.2	2.9	1.1
EENT	0	2.7	0	3.3	1.2
Other	5.3	3.9	3.3	5.7	4.9
Average	7.6	4.9	6.0	7.6	6.5

Table 4. Prevalence rates % of N.I. by sites and by categories of hospitals (%)

Sites	Categories of hospitals, %				Total average %
	U	R	P	O	
Lower respiratory	37.9	39.8	33.6	32.2	36.1
Urinary	22.4	19.8	25.0	35.0	25.5
Surgical	8.6	13.0	14.8	9.6	11.0
Blood stream	9.9	9.9	8.6	7.3	9.0
Skin, Soft tissue	9.5	8.1	9.4	4.0	7.7
Gastrointestinal	4.6	3.7	3.1	4.0	3.9
Other	7.3	5.5	5.4	8.0	6.8

Nosocomial pathogens were identified in 70.8% of all episodes of NI (Table 5). Of all organisms' isolates, 90.1% were bacteria and 6.0% were fungi. Gram-negative bacteria comprised 70.2% of all isolates of which *P. aeruginosa*, *Klebsiella* spp. and *A.baumannii* predominated. Gram-positive bacteria were found in 19.9% and methicillin-resistant *S.aureus* (M.R.S.A.) in 5.0%.

At the time of data collection, 47.0% of patients were on antimicrobials (Table 6). Cephalosporins were the most commonly prescribed (31.6%) followed by penicillins, aminoglycosides, betalactam/betalactamase inhibitor and quinolones (17.3%, 9.1%, 7.8% and 7.6%) respectively.

Discussion

Prevalence survey is one of the reliable tools to monitor the change of NI rates after intervention measures^(2,7). By intensive campaigning, the NI prevalence in Thailand was reduced from 11.7% in 1988 to 7.4% in 1992⁽²⁾. The infection rate was further slightly

brought down to 6.4% in 2001⁽³⁾, and 6.5% in the present study. The infection rates were comparable from a big study in France⁽⁸⁾. There has been little change in the prevalence rates of NI in Thailand for the past 15 years. Efforts to reduce NI have been hampered by budget deficit, the movement of health-care professionals from governmental to private sectors. The reduction of prevalence rate from 6.5% in 2001 to 4.9% in the present study in regional hospitals is partly attributed to the remarkable efforts of the infection control teams and more to the change of healthcare delivery system. It reduces the burden of big regional hospitals in taking care of severely ill patients referred from smaller hospitals. The latter have to reduce referrals in order to decrease the reimbursement from hospitals where the patients are referred to. The change in the above mentioned payment system resulted in increased burden of small, less prepared hospitals to take care of seriously ill patients. As a result, the NI prevalence rate increased from 4.9% to 6.0% and 6.9% to 7.6% in 2001 and 2006

Table 5. Nosocomial pathogens by categories of hospitals (Total episodes of NI = 699)

Pathogens	Categories of hospitals, %				Total average %
	U	R	P	O	
Pathogens identified	75.8	73.9	58.1	70.6	70.8
No growth	6.9	1.2	10.9	13.0	7.9
Culture not done	13.4	22.4	23.3	11.3	16.7
Result not available	3.9	2.5	7.8	5.1	4.6
Bacteria					
Gram-positive	20.3	20.5	14.0	23.2	19.9
MRSA*	5.6	4.3	0.8	7.9	5.0
MSSA**	3.9	3.7	3.1	0.6	2.9
<i>Enterococcus</i> spp.	3.0	5.0	2.3	6.8	4.3
Other	7.8	7.5	7.8	7.9	7.7
Gram-negative	72.0	75.2	61.2	70.1	70.2
<i>P. aeruginosa</i>	13.8	13.0	11.6	14.7	13.4
<i>Klebsiella</i> spp.	10.3	16.1	12.4	5.6	10.9
<i>A. baumannii</i>	12.1	16.8	5.0	6.8	10.7
<i>E. coli</i>	12.9	6.8	10.1	15.8	6.9
Other	22.9	22.5	22.1	27.2	28.3
Fungus	8.2	5.0	2.3	6.8	6.0
Virus	0.9	0	0	0.6	0.4
Other	0.4	1.9	9.3	6.8	4.0

* MRSA = methicillin resistant *S. aureus*

**MSSA = methicillin sensitive *S. aureus*

Table 6. Antimicrobials used

Antimicrobials	Categories of hospitals, %				Total average %
	U	R	P	O	
Patients on antimicrobials	38.8	46.2	55.7	50.2	47.0
Antimicrobials used					
Cephalosporins	31.7	32.2	28.8	30.9	31.6
Penicillins	10.9	22.3	25.6	8.6	17.3
Aminoglycosides	7.8	10.4	11.8	5.7	9.1
Betalactam/ betalactamase inhibitor	11.3	7.1	5.3	7.5	7.8
Quinolones	6.7	5.3	7.3	11.8	7.6
Metronidazole	5.7	7.0	3.3	3.8	5.1
Macrolides	4.5	2.1	3.5	5.3	3.7
Carbapenems	4.8	1.6	4.5	4.6	3.7
Other	16.6	12.0	9.9	21.8	17.8

in smaller provincial and other hospitals respectively. Better infection control is undoubtedly more needed in small hospitals.

Intensive care units carry the highest risk of

NI^(1,2,9). In the present study, NI was present in 22.6% of ICU patients. Infection control is a priority in ICU in all hospitals. Risk factors in these patients are to be identified for planning proper preventive measures.

The infection was also prevalent in surgical, medical, orthopedic, and pediatric departments (6.8%, 6.7%, 6.7%, and 5.5% respectively) (Table 3).

Lower respiratory tract was the commonest site of NI (36.1%) (Table 4). In the authors' 1988 study⁽¹⁾, urinary tract was the most prevalent site, the same finding was found in other studies^(11,12). Since 1992, lower respiratory tract infection has been the most common NI in Thailand^(2,3). A study on risk factors for nosocomial pneumonia is needed to improve preventive measures⁽¹³⁾. To reduce the incidence of nosocomial pneumonia, multiple approaches, especially the co-operation and competency of ICU personnel, have been proved successful⁽¹⁴⁾. Urinary tract, surgical site and blood stream infections were found in decreasing order (25.5%, 11.0%, and 9.0% respectively).

Nosocomial pathogens were identified in 70.8% of episodes of NI (Table 5). Gram-negative bacteria were the commonest group of micro-organisms. *P. aeruginosa*, *Klebsiella* spp., *A. baumannii* were leading bacteria found in cultures (13.4%, 10.9%, and 10.7% respectively). Among Gram-positive bacteria, MRSA was the commonest (5.0% of all pathogens). The types and proportion of bacteria in the present study were almost identical to the last study in 2001⁽³⁾. The prevalence of antimicrobial-resistant bacteria reflects the failure to control these organisms. The pattern of antimicrobial used in hospitals has also altered. Cephalosporins were used more in the present study compared to 2001⁽³⁾. Betalactams/ betalactamase inhibitors and carbapenems have been increasingly used, mainly due to the surge of drug resistant bacteria. Unless dramatic actions are taken, the problem of antimicrobial resistance and drug costs will soon spin out of control.

Conclusion

The present study of NI in 20 hospitals involving 9,865 patients in Thailand in 2006 showed a prevalence rate of 6.5%. The NI was highest in ICU. Lower respiratory tract was the commonest site of NI. Gram-negative bacteria accounted for 70.2% of pathogens identified. More potent, expensive antimicrobials were prescribed.

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References

1. Danchaivijitr S, Chokloikaew S. A national prevalence study on nosocomial infections 1988. *J Med Assoc Thai* 1989; 72(Suppl 2): 1-6.
2. Danchaivijitr S, Tangtrakool T, Waitayapiches S, Chokloikaew S. Efficacy of hospital infection control in Thailand 1988-1992. *J Hosp Infect* 1996; 32: 147-53.
3. Danchaivijitr S, Dhiraputra C, Santiprasitkul S, Judaeng T. Prevalence and impacts of nosocomial infection in Thailand 2001. *J Med Assoc Thai* 2005; 88(Suppl 10): S1-9.
4. Gastmeier P, Kampf G, Wischniewski N, Hauer T, Schulgen G, Schumacher M, et al. Prevalence of nosocomial infections in representative German hospitals. *J Hosp Infect* 1998; 38: 37-49.
5. Sheng WH, Wang JT, Lu DC, Chie WC, Chen YC, Chang SC. Comparative impact of hospital-acquired infections on medical costs, length of hospital stay and outcome between community hospitals and medical centres. *J Hosp Infect* 2005; 59: 205-14.
6. Stone PW, Larson E, Kawar LN. A systematic audit of economic evidence linking nosocomial infections and infection control interventions: 1990-2000. *Am J Infect Control* 2002; 30: 145-52.
7. Metintas S, Akgun Y, Durmaz G, Kalyoncu C. Prevalence and characteristics of nosocomial infections in a Turkish university hospital. *Am J Infect Control* 2004; 32: 409-13.
8. The French Prevalence Survey Study Group. Prevalence of nosocomial infections in France: results of the nationwide survey in 1996. *J Hosp Infect* 2000; 46: 186-93.
9. Toufen JC, Hovnanian AL, Franca SA, Carvalho CR. Prevalence rates of infection in intensive care units of a tertiary teaching hospital. *Rev Hosp Clin Fac Med Sao Paulo* 2003; 58: 254-9.
10. Lizioli A, Privitera G, Alliata E, Antonietta Banfi EM, Boselli L, Panceri ML, et al. Prevalence of nosocomial infections in Italy: result from the Lombardy survey in 2000. *J Hosp Infect* 2003; 54: 141-8.
11. Vaque J, Rossello J, Arribas JL. Prevalence of nosocomial infections in Spain: EPINE study 1990-1997. EPINE Working Group. *J Hosp Infect* 1999; 43(Suppl): S105-11.
12. Klavs I, Bufon LT, Skerl M, Grgic-Vitek M, Lejko ZT, Dolinsek M, et al. Prevalence of and risk factors for hospital-acquired infections in Slovenia-results of the first national survey, 2001. *J Hosp Infect* 2003; 54: 149-57.

13. Kampf G, Wischniewski N, Schulgen G, Schumacher M, Daschner F. Prevalence and risk factors for nosocomial lower respiratory tract infections in German hospitals. *J Clin Epidemiol* 1998; 51: 495-502.
14. Danchaivijitr S, Assanasen S, Apisarnthanarak A, Judaeng T, Pumsuwan V. Effect of an education program on the prevention of ventilator-associated pneumonia: A multicenter study. *J Med Assoc Thai* 2005; 88(Suppl 10): S36-41.

ความชุกของโรคติดเชื้อในโรงพยาบาลในประเทศไทย พ.ศ. 2549

สมหวัง ด้านชัยวิจิตร, เทพนิมิตร จูแดง, ศิริพร ศรีพลากิจ, คัคณางค์ นาคสวัสดิ์, ธนรักษ์ ผลิพัฒน์

วัตถุประสงค์: ศึกษาความชุกของโรคติดเชื้อในโรงพยาบาล

วัสดุและวิธีการ: การศึกษาความชุกด้วยวิธี *point prevalence* ในโรงพยาบาล 20 แห่งในประเทศไทยในเดือนสิงหาคม พ.ศ.2549

ผลการศึกษา: การศึกษานี้กระทำในโรงพยาบาลรวมทั้งสิ้น 20 แห่ง เป็นโรงพยาบาลมหาวิทยาลัย 3 แห่ง, โรงพยาบาลศูนย์ 5 แห่ง โรงพยาบาลทั่วไป 5 แห่งและโรงพยาบาลอื่น ๆ 7 แห่ง ครอบคลุมผู้ป่วยทั้งสิ้น 9,865 ราย ผู้ป่วยเป็นชายและหญิงเกือบเท่ากัน อายุเฉลี่ย 42.7 ปี ความชุกของโรคติดเชื้อในโรงพยาบาลเท่ากับร้อยละ 6.5, แยกเป็นร้อยละ 7.0 ในผู้ป่วยชายและร้อยละ 5.9 ในผู้ป่วยหญิง อัตราการติดเชื้อพบสูงสุดในโรงพยาบาลมหาวิทยาลัย และโรงพยาบาลอื่น ๆ (ร้อยละ 7.6) รองลงมาคือโรงพยาบาลทั่วไป (ร้อยละ 6) และโรงพยาบาลศูนย์ (ร้อยละ 4.9) พบการติดเชื้อเกินร้อยละ 10 ในโรงพยาบาล 2 แห่ง โรงพยาบาลมหาวิทยาลัยทั้ง 3 แห่งมีความชุกเกินร้อยละ 7 อัตราการติดเชื้อพบสูงสุดในหออภิบาล (ร้อยละ 22.6) รองลงมาคือ หอผู้ป่วยศัลยกรรม (ร้อยละ 6.8) อายุรกรรม และออโรโรบิติกส์ (ร้อยละ 6.7 เท่ากัน) ตำแหน่งของการติดเชื้อที่พบสูงสุดคือทางเดินหายใจส่วนล่าง (ร้อยละ 36.1) รองลงมาคือทางเดินปัสสาวะ (ร้อยละ 25.5) ตรวจพบเชื้อก่อโรคร้อยละ 70.8 ของจำนวนครั้งของการติดเชื้อ และเชื้อร้อยละ 63 เป็นแบคทีเรีย กลุ่มเชื้อก่อโรคพบว่าเป็นแบคทีเรียที่เรียกร่วมร้อยละ 70.2 และแบคทีเรียที่เรียกร่วมร้อยละ 19.9 *Pseudomonas aeruginosa*, *Klebsiella spp.*, *Acinetobacter baumannii*, methicillin-resistant *S. aureus* และ *enterococci* เป็นแบคทีเรียที่พบบ่อย ขณะที่ศึกษาพบว่า ผู้ป่วยร้อยละ 47 ได้รับยาต้านจุลชีพ และกลุ่มยาต้านจุลชีพที่ใช้บ่อยได้แก่ cephalosporin, penicillin และ aminoglycoside

สรุป: ความชุกของโรคติดเชื้อในโรงพยาบาลในประเทศไทย ใน พ.ศ. 2549 เท่ากับร้อยละ 6.5 ซึ่งใกล้เคียงกับผลของการศึกษาก่อนหน้านี้ การเปลี่ยนแปลงของความชุกของโรคติดเชื้อบางประเภทในโรงพยาบาลแม้จะมีน้อย ก็สมควรศึกษาเพิ่มเติมเพื่อเพิ่มประสิทธิผลของการควบคุมโรคติดเชื้อในโรงพยาบาล